

WISSENSCHAFTLICHE KURZMITTEILUNGEN

Monogamy in the Bat *Rhinolophus sedulus*?

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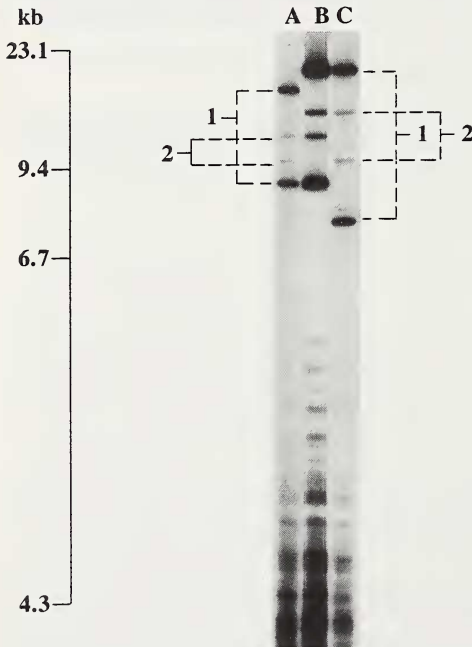
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A large variety of mating systems has been observed in bats. While a few species live in harems, other form leks and some have promiscuous mating patterns or are assumed to establish monogamous relationships (for review see BRADBURY 1977; MCWILLIAM 1987a). Some of these mating systems are comparatively well studied, while solid evidence is lacking for most. The latter applies especially to the case of monogamous species. In several bat species it is known that parents stay together even when young are present (for review see BRADBURY 1977), but in only one species (*Hipposideros beatus*) the existence of monogamous associations has been confirmed by long-term observations of marked animals for one breeding season (BROSSET 1982). In this species males and females separate at the beginning of the next mating season and new pairs are formed (BROSSET 1982).

Here we report observations on the lesser woolly horseshoe bat (*Rhinolophus sedulus* Andersen, 1905), a little known species restricted to peninsular Malaysia and Borneo. We observed it regularly (several times in 1984, 1989, 1992) roosting in road culverts alone or in pairs with and without young (HELLER and VOLLETH 1989). Its close relative, the great woolly horseshoe bat, *Rhinolophus luctus*, is also known to roost singly or in pairs and was listed by BRADBURY (1977) as probably monogamous.

The bats were found close to the Ulu Gombak Field Studies Centre of the University of Malaya (3°20' N, 101°45' E) near Kuala Lumpur (for details of the study site see HELLER and VOLLETH 1989). DNA from each animal in a single roosting group (male, female, young; forearm lengths 40, 40.5, 18.5 mm) was isolated from approximately 10 mg liver or pectoral-muscle tissue, which was cut into small pieces. DNA extraction, gel electrophoresis of Hinf I-restricted DNA and in-gel hybridization with the radiolabelled probe (GATA)<sub>4</sub> was performed as described previously (ACHMANN et al. 1992).

The DNA-profiles, which are different in all three individuals (Figure),



DNA banding pattern of a family of *Rhinolophus sedulus* (A female, B young, C male). Assumed allelic fragment pairs are connected by dashed lines, 1 and 2 refer to the same locus

were remarkable in that they were sharply divided into two distinct patterns. In the low molecular weight range the multiband pattern of all three animals appeared to be almost identical. However, in the high molecular weight range the adults are clearly distinguished by a variable pattern of four bands in each animal. Only one of these bands may result from a DNA fragment of identical molecular weight in both adults (Figure). Two out of four bands of each adult's DNA-profile were characterized by high signal intensities, whereas the two other bands were considerably fainter. Since only one of each type is transmitted from each parent to the young, it is possible that two polymorphic loci were detected. In this case all animals would be considered heterozygous at both loci.

All bands of the young could be traced back to the female or the male, which suggested that both adults were the parents of the young. However, in the absence of more information on band-sharing or allele frequencies in *R. sedulus*, it is not possible to estimate exactly the probability of incorrect parentage. For the lactating female, maternity is surely not in question. For the putative father, however, the chance of incorrectly assigned parenthood depends primarily on the population allele frequencies of the detected bands. Given the two paternal-specific bands and a mean band-sharing coefficient (LANSMAN et al. 1981) of  $x = 0,25$  (obtained from the comparison of both adults) the factor of  $0,25^2 = 6,25\%$  would be a crude estimate of the probability that another male not closely related to the putative father actually fathered the young.

The DNA-profile of the young compared with that of the male and the female suggest that both adult animals were the parents of the young. The pairwise roosting behavior and these DNA profiles support the hypothesis of a stable male-female association after mating and even after the birth of the young, indicating a monogamous relationship. We have no information, however, on whether the observed pair remained together for more than one season as found in some harem breeding bats (e.g. MCWILLIAM 1987b), or whether *R. sedulus* is seasonally monogamous as is *Hipposideros beatus* (BROSSET 1982).

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